

ASSIGNMENT 10

Textbook kAssignment: "Engineering and Land Surveys." Pages 10-30 through 10-37 and
"Horizontal and Vertical Curves." Pages 11-1 through 11-21.

Learning Objective: Indicate the purpose, principles, and practical uses of land surveys. Identify the duties of the land surveyor.

10-1. What type of survey determines the boundaries and areas of a property?

1. Geodetic
2. Hydrographic
3. Land
4. Each of the above

10-2. The term *deed* is a legal instrument whereby a

1. surveyor is permitted to determine the boundaries of another person's real property
2. person denies the use of his real property for a specific purpose to another person
3. person transfers his right to real property to another person
4. surveyor is permitted to occupy real property to determine the boundaries of other real property

10-3. All real estate deeds written in the United States must contain what information?

1. A leasehold
2. An easement
3. An accurate boundary description
4. A judge's signature

10-4. When a particular land tract is defined by the lengths and bearings of its boundaries, the tract is described by what term?

1. Deed references
2. The coordinates of property corners
3. Blocks, tracts, or subdivisions
4. Metes and bounds

10-5. When magnetic bearings are read, which of the following information should be stated on the description of the land tract?

1. Computed azimuths
2. Declination and date of the survey
3. Plane coordinate of the corner monuments
4. Geodetic coordinates of the corner monuments

10-6. Modern surveying practice calls for a surveyor to supplement metes-and-bounds descriptions of boundaries with additional descriptive elements when available.

1. True
2. False

10-7. From which of the following points should a metes-and-bounds description start?

1. At an established monument
2. At a base line
3. At a neighboring boundary
4. At a bench mark

- 10-8. When property is transferred, what laws must be followed when the description and plan are recorded?
1. Federal
 2. State
 3. County
 4. City
- 10-9. In preparing a metes-and-bounds description, you may add the bearings of the boundary lines for retracing the lines to which of the following measurements?
1. Azimuths
 2. Back azimuths
 3. Exterior angles
 4. Interior angles
- 10-10. What agency publishes manuals that provide regulations on the subdivision of public lands?
1. Bureau of Public Highways
 2. Bureau of Land Management
 3. U.S. Coast and Geodetic Survey
 4. Naval Facilities Engineering Command
- 10-11. The grid line that forms a right angle to the central meridian on a state grid system is known by what name?
1. X-axis
 2. Y-axis
 3. Southern grid basis line
 4. Graticule
- 10-12. How are blocks, tracts, and subdivisions indicated on maps?
1. Tracts and subdivisions are numbered; whereas, blocks are named
 2. Subdivisions are numbered; whereas, blocks and tracts are named
 3. Tracts are numbered; whereas, blocks and subdivisions are named
 4. Tracts and blocks are numbered; whereas, subdivision are named
- 10-13. Which of the following types of data is contained in the map books that are filed in the recorder's office?
1. Subdivision boundaries and locations
 2. Map history
 3. Bench mark locations
 4. Listing of all the pertinent maps for a subdivision
- 10-14. During a boundary survey, which of the following information must be reported by the surveyor?
1. Correction to the original survey
 2. Encroachments, easements, or any discrepancies
 3. Man-hours spent on the survey
 4. All errors made during the survey
- 10-15. What is a primary responsibility for a land surveyor making surveys on property boundaries?
1. To ensure the establishment of blocks, tracts, and subdivision
 2. To meet the requests of the property owners
 3. To prepare data that may be submitted as evidence for property disputes
 4. To verify previous surveys so property may be transferred
- 10-16. How do land surveys differ from other types of surveys?
1. The surveyor may be required to make boundary decisions from conflicting evidence
 2. More experience is required to perform land surveys
 3. The accuracy required for land surveys is more precise
 4. Methods for determining horizontal locations are different

- 10-17. What is normally the first step in performing a land survey?
1. Obtain copies of all boundary descriptions and records
 2. Locate and study all boundary records
 3. Locate in the field all existing boundaries
 4. Relocate all existing monuments
- 10-18. Who is held responsible for inaccuracies in a survey?
1. The note keeper
 2. The surveyor
 3. The property owner
 4. The original surveyor
- 10-19. Which of the following types of boundary markers should be avoided?
1. Tree
 2. Edge of a stream
 3. 2-in. by 2-in. hub
 4. 2-in.-diameter steel pipe
- 10-20. One of the procedures for establishing property boundaries is the marking of points that have been destroyed since previous surveys.
1. True
 2. False
- 10-21. Plats are drawn on what size sheet?
1. 9 in. x 12 in.
 2. 11 in. x 14 in.
 3. 17 in. x 22 in.
 4. 19 in. x 24 in.
- 10-22. When an extensive drawing is printed in color on a plat, how, if at all, are wooded areas indicated when other important details are located in the woods?
1. The wooded area is shaded light green
 2. The wooded area is indicated by a note in the margin of the plat
 3. The words *WOODED AREA* are printed in black in the area of the woods
 4. The wooded area would not be indicated because the marking would obscure the other details
- 10-23. What is the final step, required by law in some states, to be completed by the land surveyor before a plat is filed in the district land office?
1. Certification of the plat
 2. Preparation of the property description
 3. Preparation of the plat and a recheck of the accuracy
 4. Approval of the field survey notes
- 10-24. On a plat of surveyed land, what is a departing property line?
1. A boundary line that has been moved or reestablished
 2. A boundary line that is in dispute
 3. A boundary line that can only be referenced to one permanent monument
 4. A boundary line from one boundary through adjacent property
- 10-25. What information is required on a property plat?
1. Name of all adjacent property owners
 2. Grid lines
 3. Surveyor's certification statement
 4. Area of the enclosed property

10-26. By which of the following methods would the corners of a large naval station normally be located for a boundary survey?

1. Transit-tape survey
2. Triangulation
3. Geodetic survey
4. Traversing

10-27. The precision of a land survey is determined on the basis of which of the following factors?

1. Experience of the surveyor
2. Value of the property
3. Types of structures that will be constructed near the boundary lines
4. Both 2 and 3 above

Learning Objective: Recognize terms associated with horizontal curves; identify types and elements of horizontal curves; identify some basic formulas associated with simple computation.

10-28. A highway is composed of a series of curves and straight lines. The term for these straight lines is

1. traverses
2. radii
3. tangents
4. center lines

10-29. What is the principle consideration in curve design?

1. Speed of the highway
2. Degree of curvature
3. Length of the radius
4. Both 2 and 3 above

10-30. What type of curve consists of two joined circular curves that have radii on the same side of the highway?

1. Simple
2. Compound
3. Spiral
4. Reverse

- A. Degree of curve
 - B. Point of curve
 - C. External distance
 - D. Central angle

Figure 10A

IN ANSWERING QUESTIONS 10-31 THROUGH 10-36, SELECT FROM FIGURE 10A THE ELEMENT OF A CURVE DESCRIBED BY THE ITEM. INDIVIDUAL RESPONSES MAY BE USED MORE THAN ONCE OR NOT AT ALL.

10-31. The angular value that is equal to the intersecting angle (I):

1. A
2. B
3. C
4. D

10-32. The angle formed by two radii that subtend an arc of 100 feet:

1. A
2. B
3. C
4. D

10-33. A point on the curve:

1. A
2. B
3. C
4. D

10-34. The angle formed by the radii of a simple curve:

1. A
2. B
3. C
4. D

10-35. This determines the flatness or sharpness of a highway:

1. A
2. B
3. C
4. D

10-36. This bisects the interior angle at the point of intersection:

1. A
2. B
3. C
4. D

10-37. For a degree of curvature of 1° , the radius is 5,729.58 ft. Which of the following equations could be used to derive this value?

1. $\frac{D}{360} = \frac{Arc}{2\pi R}$
2. $2\pi R = 36,000$
3. $\frac{1}{360} = \frac{100}{2\pi R}$
4. Each of the above

Learning Objective: Recognize correct procedures and perform mathematical computations to solve simple horizontal curve situations.

10-38. To solve for the tangent distance, you must know what information?

1. Point of tangency
2. Point of curvature
3. Central angle and radius
4. Each of the above

10-39. You must know the degree of the curve to solve for which of the following information?

1. Chord distance
2. Curve distance
3. Tangent distance
4. External distance

10-40. When calculating the length of the curve using the chord definition, you obtain a value slightly less than the true length of the curve.

1. True
2. False

10-41. What is the recommended procedure for laying out a curve?

1. Swing the arc with a tape
2. Set up a transit at the PI and turn the interior angles
3. Set up a transit at the PC and turn the interior angles
4. Set up the transit at the PC and turn deflection angles

10-42. The degree of curve required for the layout of a road section is 20° . When you lay out this curve, what chord length should you use to minimize the difference between arc and chord distances?

1. 10 ft
2. 25 ft
3. 50 ft
4. 100 ft

IN ANSWERING QUESTIONS 10-43 THROUGH 10-52, YOU ARE TO LAY OUT A HORIZONTAL CURVE BY ARC DEFINITION, USING THE FOLLOWING DATA:

$$\begin{aligned}PI &= \text{Sta. } 16 + 24.60 \\I &= 60^\circ \\D &= 8^\circ\end{aligned}$$

10-43. How long is the radius(R) for the curve?

1. 708.20 ft
2. 716.20 ft
3. 720.20 ft
4. 728.20 ft

10-44. What is the plus station at the PC?

1. 12 + 11.10
2. 12 + 12.60
3. 20 + 38.10
4. 20 + 40.20

10-45. What station should you mark the stake at the PT?

1. 23 + 74.60
2. 23 + 46.10
3. 19 + 61.10
4. 19 + 51.10

- 10-46. What is the value of the external distance (E)?
1. 108.10 ft
 2. 110.80 ft
 3. 112.80 ft
 4. 114.60 ft
- 10-47. What is the value of the middle ordinate (M)?
1. 75.95 ft
 2. 82.55 ft
 3. 89.85 ft
 4. 95.95 ft
- 10-48. How long is the long chord (LC)?
1. 716.20 ft
 2. 718.20 ft
 3. 720.10 ft
 4. 722.10 ft
- 10-49. What is the size of the deflection angle you would use for a 50-foot chord?
1. $1^{\circ}30'$
 2. $2^{\circ}00'$
 3. $2^{\circ}30'$
 4. $3^{\circ}00'$
- 10-50. With a chord length of 50 feet, what is the distance from the PC to the first point on the curve?
1. 11.10 ft
 2. 25.40 ft
 3. 38.90 ft
 4. 50.00 ft
- 10-51. The deflection angle used for the distance above is
1. $1^{\circ}30'$
 2. $1^{\circ}33'$
 3. $1^{\circ}35'$
 4. $1^{\circ}45'$
- 10-52. What is the deflection angle, d_2 , for the last subchord to the PC ?
1. $0^{\circ}15'$
 2. $0^{\circ}25'$
 3. $0^{\circ}27'$
 4. $0^{\circ}30'$
- 10-53. The degree of curve and the intersecting angle are both given in degrees and minutes. Which of the following actions should you take during the computation to maintain the degree of accuracy?
1. Round off angles to the nearest tenth of a degree
 2. Round off angles to the nearest hundredths of a degree
 3. Convert angles to minutes for computations
 4. Convert angles to seconds for computations
- 10-54. The first step in staking out a simple curve is to set the instrument up at what point?
1. PC
 2. PI
 3. PT
 4. Midpoint
- 10-55. As a check during the stakeout of a simple curve, the angle from the PI to the PT is measured while the instrument is still at the PC . The angle should equal which of the following values?
1. One half of the central angle
 2. One half of the intersecting angle
 3. The total of the deflection angles
 4. Each of the above
- 10-56. What is gained by using the "backing-in" method of staking out a horizontal curve?
1. Fieldwork is accomplished much faster
 2. Curve distortion is minimized by applying the error at the center of curve
 3. Fewer instrument setups are needed
 4. Deflection angles can be turned more accurately

Learning Objective: Recognize terms associated with vertical curves; identify types and elements of vertical curves.

10-57. What is a vertical curve at the bottom of a hill?

1. Summit curve
2. Oververtical curve
3. Sag curve
4. Compound curve

10-58. A constant slope between curves is known by what term?

1. Grade
2. Grade tangents
3. Gradient
4. Each of the above

10-59. Vertical curves are usually what shape?

1. Parabolic
2. Circular
3. Elliptical
4. Hyperbolic

10-60. In a vertical curve system, the point of vertical tangency is located at what point?

1. Where the curve begins
2. Where the curve ends
3. Where the grade tangents intersect
4. At any point on the tangent

10-61. Vertical curves are used at locations other than the top or bottom of a hill.

1. True
2. False

Learning Objective: Recognize and use the fundamental principles of symmetrical and unsymmetrical curve computation; recognize basic procedures associated with checking computation by plotting, using a profile work sheet, and making a field stakeout of vertical curves.

10-62. What factor makes a curve symmetrical?

1. g_1 equals g_2
2. L_1 equals L_2
3. Both 2 and 3 above
4. G equals zero

10-63. Usually, the *PVC* and *PVT* are designed to be set at what location along the survey?

1. At full stations or half stations
2. At 25-foot intervals
3. Points on the same parabola
4. Any of the above

10-64. Given a *PVC* elevation of 100 ft, a first slope of +4%, a second slope of +2%, and $L = 400$ ft. On a symmetrical curve, what is the elevation of the *PVT*?

1. 107 ft
2. 112 ft
3. 116 ft
4. 120 ft

10-65. Given a *PVC* elevation of 100 ft, a first slope of +4%, a second slope of +2%, and $L = 400$ ft. What is the value of the middle vertical offset?

1. -0.5 ft
2. -1.0 ft
3. -1.5 ft
4. -2.0 ft

10-66. The middle vertical offset on a symmetrical vertical curve is 2 ft and $L = 400$ ft. What is the value of the vertical offset at the first station ahead of the *PVC*?

1. 2.0 ft
2. 1.5 ft
3. 1.0 ft
4. 0.5 ft

IN ANSWERING QUESTIONS 10-67 AND 10-68, USE THE FOLLOWING INFORMATION.

PVC IS AT STA. $39 + 00$ ELEV = 100.00 FT
 $L = 1000$ FT $g_1 = +10\%$ $g_2 = -2\%$

10-67. The turning point for this curve will be located at what station?

1. $47 + 57.8$
2. $44 + 24.5$
3. $40 + 91.2$
4. $40 + 24.5$

10-68. The elevation of the turning point is

1. 101.23 ft
2. 101.67 ft
3. 103.33 ft
4. 105.00 ft

10-69. When computing the elevations of symmetrical vertical curves, you can check the accuracy of your computation through a derived constant value for the

1. second differences in elevations of successive stations
2. vertical offsets of successive stations
3. second differences in elevations of adjacent stations
4. e value at successive stations

IN ANSWERING QUESTIONS 10-70 and 10-71, YOU ARE LAYING OUT A 1,500-FOOT VERTICAL CURVE. THE ELEVATION AT THE *PVC* IS 326.21 FT. THE *PVC* IS LOCATED AT STATION $29 + 00$.

$$g_1 = -8\% \quad g_2 = +4\% \quad l_1 = 500 \text{ ft}$$

10-70. The middle vertical offset is

1. 6 ft
2. 10 ft
3. 16 ft
4. 20 ft

10-71. The turning point is at station

1. $29 + 31.3$
2. $34 + 31.3$
3. $38 + 31.3$
4. $44 + 31.3$

10-72. Vertical curve computation should be checked by plotting the curve on an exaggerated scale in which the vertical scale is larger than the

1. vertical offset
2. horizontal scale
3. ship's curve
4. stationing

10-73. The original tracing of a road profile will contain which of the following information?

1. Tangent elevations
2. The vertical offsets
3. Length of the curve
4. x/l ratio

10-74. The procedure used to set grade stakes for a *POVC* differs greatly from the procedure used to set grade stakes for a point on a grade tangent.

1. True
2. False